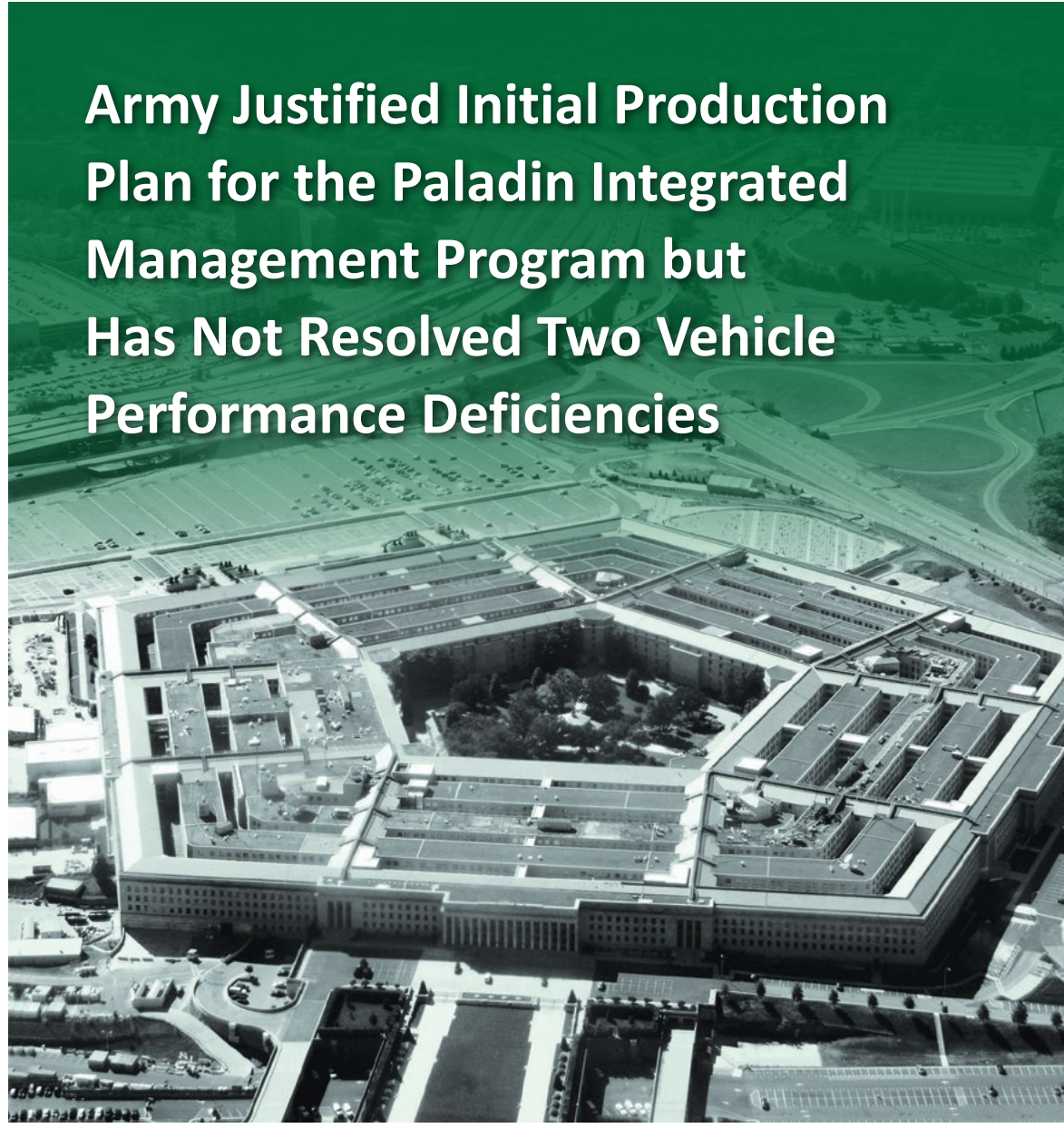


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INSPECTOR GENERAL

U.S. Department of Defense

AUGUST 5, 2016



Army Justified Initial Production Plan for the Paladin Integrated Management Program but Has Not Resolved Two Vehicle Performance Deficiencies

INTEGRITY ★ EFFICIENCY ★ ACCOUNTABILITY ★ EXCELLENCE

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INTEGRITY ★ EFFICIENCY ★ ACCOUNTABILITY ★ EXCELLENCE

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Vision

Our vision is to be a model oversight organization in the Federal Government by leading change, speaking truth, and promoting excellence—a diverse organization, working together as one professional team, recognized as leaders in our field.



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Results in Brief

Army Justified Initial Production Plan for the Paladin Integrated Management Program but Has Not Resolved Two Vehicle Performance Deficiencies

August 5, 2016

Objective

We determined whether the Army effectively managed the Paladin Integrated Management (PIM) program during the production and deployment phase. Specifically, we evaluated whether program officials justified the low-rate initial production plan and whether test plans and results adequately prepared the program for full-rate production. This report is the first in a series of reports on the Army PIM program, which includes ammunition carriers and projectile-firing armored vehicles, called howitzers, for use in ground combat. During full-rate production, the Army will complete PIM vehicle production.

Finding

PIM program officials justified their plan to produce 133 initial production vehicles. The plan included 33 test vehicles and 100 production vehicles—the minimum necessary to maintain the production line and gradually increase production before full-rate production. Further, PIM program officials initiated system fixes to address seven of the nine performance deficiencies identified by the test community during the system development phase. PIM program officials also updated test plans to evaluate vehicle performance before full-rate production. However, Army Fires Center of Excellence, which developed PIM program operational requirements, and PIM program officials continued to address test community recommendations for

Finding (cont'd)

deficiencies in the rate-of-fire requirement and the automatic fire extinguisher system (AFES). Army officials did not fully address two test community recommendations because:

- Army Fires Center of Excellence officials were revising the maximum rate-of-fire requirement for different firing conditions in the capability production document; and
- PIM program officials were exploring methods to fix the deficiency in the AFES in howitzer crew compartments after initially disagreeing with the test community recommendation.

As a result, Army Fires Center of Excellence and PIM program officials risk deploying vehicles that do not meet performance requirements and that could endanger crews. Additionally, PIM program officials may incur costly vehicle retrofits to address the deficiency in the AFES if not adequately addressed before full-rate production.

Recommendations

We recommend the Commander, U.S. Army Fires Center of Excellence, include a clear maximum rate-of-fire requirement for different firing conditions in the capability production document before operational testing. We also recommend the Program Executive Officer, Ground Combat Systems, evaluate and fix the deficiency in the AFES in howitzer crew compartments before deploying the first vehicles to minimize fire risk to soldiers and reduce retrofit costs.

Management Comments and Our Response

The Commander, U.S. Army Fires Center of Excellence, agreed with the recommendation. The Deputy Program Executive Officer, Ground Combat Systems, responding for the Program Executive Officer, disagreed with the recommendation. The Deputy stated that adding more AFES coverage to the crew



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Results in Brief

Army Justified Initial Production Plan for the Paladin Integrated Management Program but Has Not Resolved Two Vehicle Performance Deficiencies

Management Comments (cont'd)

compartment will delay fielding—risking soldier safety and decreasing Army capabilities. However, the Deputy did not support that incorporating additional AFES coverage would delay fielding the PIM program or how the delay would impact the mission, readiness, or cost. Further, the Deputy did not take into account the results and recommendations of the AFES engineering project or include a specific timeline for planned corrective actions. Without addressing the AFES deficiency, the Army could deploy vehicles that endanger crews. Therefore, we ask that the Program Executive Officer fix the AFES deficiency before deploying the first vehicles. We also request that the Program Executive Officer provide an action plan and completion dates to address the results and recommendations of the AFES engineering project. Please see the Recommendations Table on the next page.

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Recommendations Table

Management	Recommendations Requiring Comment	No Additional Comments Required
Commander, U.S. Army Fires Center of Excellence		1
Program Executive Officer, Ground Combat Systems	2	

Please provide Management Comments by September 6, 2016.





**INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
4800 MARK CENTER DRIVE
ALEXANDRIA, VIRGINIA 22350-1500**

August 5, 2016

MEMORANDUM FOR AUDITOR GENERAL, DEPARTMENT OF THE ARMY


SUBJECT: Army Justified Initial Production Plan for the Paladin Integrated Management Program but Has Not Resolved Two Vehicle Performance Deficiencies
(Report No. DODIG-2016-118)

We are providing this report for review and comment. Paladin Integrated Management program officials justified their plan to produce 133 vehicles, initiated system fixes, and updated test plans to evaluate vehicle performance before full-rate production. However, officials with the Army Fires Center of Excellence and the Paladin Integrated Management program continued to address test community recommendations for deficiencies in the rate-of-fire requirement and the automatic fire extinguisher system. We conducted this audit in accordance with generally accepted government auditing standards.

We considered management comments on a draft of this report. DoD Instruction 7650.03 requires that recommendations be resolved promptly. Comments from the Deputy Program Executive Officer, Ground Combat Systems, responding for the Program Executive Officer, did not address the specifics of Recommendation 2. Therefore, we request that the Program Executive Officer, Ground Combat Systems, provide additional comments on Recommendation 2 by September 6, 2016.

Please send a PDF file containing your comments to audasm@dodig.mil. Copies of your comments must have the actual signature of the authorizing official for your organization. We cannot accept the /Signed/ symbol in place of the actual signature. If you arrange to send classified comments electronically, you must send them over the SECRET Internet Protocol Router Network (SIPRNET).

We appreciate the courtesies extended to the staff. Please direct questions to me at (703) 604-9077 (DSN 664-9077).


Jacqueline L. Wicecarver
Assistant Inspector General
Acquisition and Sustainment Management

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Acronyms and Abbreviations

Introduction

Objective

We determined whether the Army effectively managed the Paladin Integrated Management (PIM) program during the production and deployment phase. Specifically, we evaluated whether program officials justified the low-rate initial production (initial production) plan and whether test plans and results adequately prepared the program for full-rate production (FRP). This report is the first in a series of reports on the Army PIM program. See Appendix A for a discussion of the audit scope and methodology and prior coverage related to the objectives.

Background

The Army's PIM program includes ammunition carriers and projectile-firing armored vehicles, called howitzers, for use in ground combat. The program is an acquisition category IC major defense acquisition program. An acquisition category IC program has research, development, test, and evaluation costs of more than \$480 million or procurement costs of more than \$2.79 billion. PIM program officials estimated that program costs include \$1.10 billion in research, development, test, and evaluation and \$6.85 billion in procurement funds.

The Product Manager, Self-Propelled Howitzer Systems, manages the PIM program. The product manager reports to the Project Manager for Armored Fighting Vehicles under the Program Executive Officer, Ground Combat Systems. The Army Fires Center of Excellence (FCoE) at Fort Sill, Oklahoma, developed PIM program operational requirements. FCoE trains soldiers and develops capabilities to ensure forces can accomplish their missions.

On October 21, 2013, the Under Secretary of Defense for Acquisition, Technology, and Logistics, the PIM program milestone decision authority,¹ approved the program to enter the initial production phase of the acquisition process. The Under Secretary authorized PIM program officials to procure 133 vehicles, about 12 percent² of the total planned quantity of 1,112 vehicles. The Under Secretary served as the milestone decision authority until September 11, 2015, when he delegated his authority to the Assistant Secretary of the Army for Acquisition, Logistics, and Technology. In March 2017, the Assistant Secretary will decide whether to increase production based on operational test results. The Assistant Secretary's decision will authorize the PIM program to begin FRP.

¹ The milestone decision authority is the final decision maker for program reviews.

² DoD Instruction 5000.02, "Operation of the Defense Acquisition System," January 7, 2015, states program offices should document the rationale for an initial production quantity exceeding 10 percent of the total production quantity in the acquisition strategy.

Army Modernized Howitzers and Ammunition Carriers

In 2011, the Army began the PIM program to modernize weapons vehicles that operate as a set of one ammunition carrier and one howitzer (see Figure). The modernization aims to increase force protection and improve survivability, mobility, and lethality of the vehicles.

The howitzer is an aluminum-armored, tracked vehicle with a cannon and an automatic fire control system. The ammunition carrier supplies ammunition to the howitzer. Both vehicles have a newly-designed hull, modified power train and suspension systems, modernized electrical systems, and a conditioned air filtration system. PIM program officials estimated each modernized set would cost \$10.4 million. The Army will use the PIM vehicles as part of Armored Brigade Combat Teams and Field Artillery Battalions.



Figure. PIM Vehicle Sets—Ammunition Carrier and Howitzer
Source: PIM Program Office

PIM Program Test Community

The PIM program test community included the Deputy Assistant Secretary of Defense for Developmental Test and Evaluation (DASD[DT&E]), the Director, Operational Test and Evaluation (DOT&E), and the Army Test and Evaluation Command (ATEC).

The DASD(DT&E) oversees PIM program developmental tests and provides an assessment of these tests to the Under Secretary of Defense for Acquisition, Technology, and Logistics.

The DOT&E oversees PIM program operational and live-fire tests and provides an assessment of these tests to Congress, the Secretary of Defense, and the Under Secretary of Defense for Acquisition, Technology, and Logistics. The DOT&E must approve operational test plans, and analyze and report test results before FRP. The DOT&E must report whether PIM vehicles are effective, suitable, and could survive in combat based on operational tests.

ATEC is the lead independent test agency for the PIM program. ATEC officials provide their assessment of the PIM program's developmental and operational test results to stakeholders.

Acquisition Guidelines for Production Phase

DoD guidance³ states that the purpose of the production and deployment phase is to produce and deliver products that meet user requirements. The production and deployment phase includes initial production, operational tests, and FRP. Before FRP, the milestone decision authority will review and assess test results from the initial production phase to determine whether a program's performance is acceptable. Program officials must resolve critical performance deficiencies before proceeding to FRP.

Review of Internal Controls

DoD guidance⁴ requires DoD organizations to implement a comprehensive system of internal controls that provides reasonable assurance that programs operate as intended and to evaluate the effectiveness of the controls. PIM program officials' internal controls over the initial production plan and test plans and results were effective as they applied to the audit objectives.

³ DoD Instruction 5000.02, "Operation of the Defense Acquisition System," January 7, 2015.

⁴ DoD Instruction 5010.40, "Managers' Internal Control Program Procedures," May 30, 2013.

Finding

Army Justified Initial Production Plan for the Paladin Integrated Management Program but Has Not Resolved Two Vehicle Performance Deficiencies

PIM program officials justified their plan to produce 133 initial production vehicles. The plan included 33 test vehicles and 100 production vehicles—the minimum necessary to maintain the production line and gradually increase production before FRP. Further, PIM program officials initiated system fixes to address seven of the nine performance deficiencies identified by the test community during the system development phase. PIM program officials also updated test plans to evaluate vehicle performance before FRP. However, FCoE and PIM program officials continued to address test community recommendations for deficiencies in the rate-of-fire requirement and the automatic fire extinguisher system (AFES). Army officials did not fully address two test community recommendations because:

- FCoE officials were revising the maximum rate-of-fire requirement for different firing conditions in the capability production document; and
- PIM program officials were exploring methods to fix the AFES deficiency in howitzer crew compartments after initially disagreeing with the test community recommendation.

As a result, FCoE and PIM program officials risk deploying vehicles that do not meet performance requirements and that could endanger crews. Additionally, PIM program officials may incur costly vehicle retrofits to address the AFES deficiency if not adequately addressed before FRP.

PIM Program Officials Justified the Initial Production Plan

PIM program officials justified their plan to produce 133 initial production vehicles. The plan included 33 test vehicles and 100 production vehicles—the minimum necessary to maintain the production line and gradually increase production before the decision in March 2017 to begin FRP. The 133 initial production vehicles made up about 12 percent of the total planned quantity of 1,112 vehicles.

PIM program officials outlined a production schedule for the 133 vehicles in the acquisition strategy. DoD guidance⁵ states that program offices should document the rationale for an initial production quantity exceeding 10 percent of the total production quantity in the acquisition strategy. The acquisition strategy, approved by the milestone decision authority, stated that PIM program officials planned to produce 33 test vehicles and 100 more production vehicles—the minimum necessary to maintain the production line and gradually increase production before FRP. Table 1 shows PIM program officials' plan to produce four vehicles the first month (February 2015), three vehicles per month for 31 months (March 2015 to September 2017), four vehicles per month for 4 months (October 2017 to January 2018), and five vehicles per month for 4 months (February to May 2018).

Table 1. PIM Vehicle Initial Production Schedule

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total Per FY
FY 2015	0	0	0	0	4	3	3	3	3	3	3	3	25
FY 2016	3	3	3	3	3	3	3	3	3	3	3	3	36
FY 2017	3	3	3	3	3	3	3	3	3	3	3	3	36
FY 2018	4	4	4	4	5	5	5	5	FRP Start				36
Total Initial Production Quantity													133

The DOT&E approved PIM program officials' plan to use 33 test vehicles⁶ for logistics demonstration⁷ and Government tests in accordance with Federal law,⁸ which requires the DOT&E to determine the procurement quantity needed for operational tests.

PIM program officials explained that the 100 additional initial production vehicles were the minimum needed to maintain production and gradually increase production before FRP. Federal law⁹ states the initial production quantity is the minimum amount needed to support operational tests, establish an initial production base, and permit an orderly increase in the system production rate leading to FRP. PIM program officials stated that the production schedule started with three vehicles per month to meet test and logistics support requirements. The officials stated that once the contractor established the production rate

⁵ DoD Instruction 5000.02, "Operation of the Defense Acquisition System," January 7, 2015.

⁶ As of April 26, 2016, PIM program officials planned to use 34 vehicles for testing.

⁷ The Army conducts logistics demonstration to evaluate PIM vehicle maintenance which includes tests, diagnostics, replacement, and repair of vehicle components.

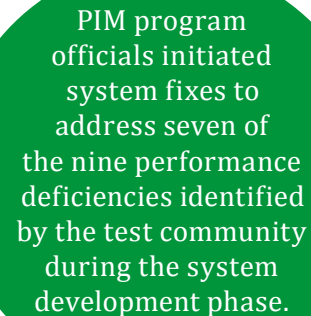
⁸ Section 2399, title 10, United States Code (10 U.S.C. § 2399 [2012]).

⁹ 10 U.S.C. § 2400 (2012).

of three vehicles per month, the rate could not decrease without disrupting the production line. The officials also stated that the contractor planned to maintain the production line at the minimum rate of three vehicles per month before gradually increasing production in FY 2018 to prepare for FRP.

PIM Program Officials Addressed Deficiencies and Updated Test Plans

PIM program officials initiated system fixes to address seven of the nine performance deficiencies identified by the test community during the system development phase. In addition, PIM program officials updated test plans to evaluate vehicle performance before FRP. DoD guidance¹⁰ states that the purpose of the production and deployment phase is to produce and deliver products that meet user requirements. The guidance:



PIM program officials initiated system fixes to address seven of the nine performance deficiencies identified by the test community during the system development phase.

- requires acceptable performance before a program proceeds to FRP, and
- allows a reasonable amount of concurrency between system development and initial production.

DoD guidance also states that concurrency can reduce time to deploy a system, but it can also increase the risk of design changes and costly retrofits.

Test Community Assessed the PIM Program Before Initial Production

DASD(DT&E), DOT&E, and ATEC officials assessed test results from the system development phase and reported their assessments to the milestone decision authority before the decision to begin initial production. Although the test community supported beginning initial production, each office identified PIM program deficiencies. We reviewed nine performance requirements that the test community reported were not met, partially met, or not tested before the decision in October 2013 to begin initial production. Table 2 summarizes performance deficiencies reported by the test community during the system development phase, before the decision to begin initial production.

¹⁰ DoD Instruction 5000.02, "Operation of the Defense Acquisition System," January 7, 2015.

Table 2. Performance Deficiencies Before the October 2013 Decision to Begin Initial Production

Performance Requirement	Performance Requirement Level	Test Community Assessment
Net Ready	Primary ¹	Partially met. Limited cybersecurity and interoperability testing.
Force Protection	Primary	Partially met. Vulnerable areas identified.
Survivability	Primary	Partially met. Vulnerable areas identified.
Rate-of-Fire	Primary	Not met. Test community recommended Army officials reevaluate requirement. Crew training important to meet requirement.
Digital Fire Control System	Primary	Partially met. Software errors disabled the system.
Availability	Primary	Not tested. No valid data available because contractor performed maintenance.
Obstacle Crossing	Secondary ²	Partially met. Stopped howitzer testing to avoid suspension damage. No tests on ammunition carrier.
Accuracy	Secondary	Partially met. Howitzer met the long-range requirement but not the short-range requirement.
AFES	Third-level ³	Not tested. No production-representative AFES on prototype vehicles.

¹ A primary requirement is critical to developing an effective military capability.

² A secondary requirement will achieve a balanced system solution but is not critical enough to be a primary requirement.

³ A third-level requirement is not as critical as a primary or secondary requirement.

Performance Deficiencies Under Review and Initial Production Vehicle Testing Continues

PIM program officials addressed or planned to address seven of the nine performance deficiencies identified in the system development phase before FRP. PIM program officials awarded a contract modification in January 2012 to implement system fixes to address performance deficiencies, and Army officials completed tests to validate fixes by March 2015. Army officials began developmental tests of initial production vehicles in May 2015 and will continue tests through September 2016. Additionally, PIM program officials updated test plans to verify system performance before the decision in March 2017 to begin FRP.

PIM program officials addressed or planned to address deficiencies related to system net-readiness, force protection, survivability, digital fire control system, availability, obstacle crossing, and accuracy performance requirements. For example, the PIM program did not meet the system net-readiness¹¹

¹¹ A net-ready system can operate on a network and exchange data securely.

requirement at the time of the decision to begin initial production because of limited cybersecurity and interoperability testing. In May 2015 and February 2016, PIM program officials tested cybersecurity with upgraded software, and also planned to test cybersecurity in October 2016. PIM program officials planned to test interoperability with upgraded software in May 2016. PIM program officials planned to use these test results to verify the PIM vehicles' effectiveness, suitability, and survivability before FRP.

See Appendix B for a summary of performance deficiencies in the system development phase, planned corrective actions, and test plans and results from the initial production phase.

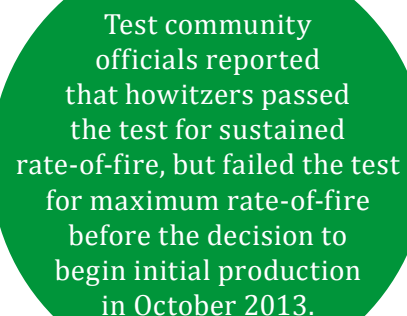
FCoE Officials Have Not Resolved the Unclear Howitzer Rate-of-Fire Requirement

FCoE officials continued to address a test community recommendation to reevaluate and clarify the howitzer maximum rate-of-fire primary performance requirement before operational testing in October 2016. The PIM program capability production document, dated January 13, 2014, stated that howitzers must fire at a maximum rate of 12 rounds in 3 minutes and at a sustained rate of 1 round per minute.

Howitzers Failed Testing for Maximum Rate-of-Fire in the System Development Phase

Test community officials reported that howitzers passed the test for sustained rate-of-fire, but failed the test for maximum rate-of-fire before the decision to begin initial production in October 2013. Howitzers failed the test for maximum rate-of-fire in 13 out of 17 attempts during the system development phase tests in 2012 and 2013.

In 2012, howitzers failed the test for maximum rate-of-fire in all nine attempts. To improve howitzer performance, PIM program officials redesigned howitzer hardware and improved software. In addition, FCoE officials trained test crews with revised firing procedures. In 2013, after vehicle improvement and crew training, howitzers passed the test for maximum rate-of-fire in four out of eight attempts under nonstressful firing conditions.¹²



Test community officials reported that howitzers passed the test for sustained rate-of-fire, but failed the test for maximum rate-of-fire before the decision to begin initial production in October 2013.

¹² The Acting DASD(DT&E) stated that nonstressful firing conditions occur when crew members use a single explosive charge and fire the howitzer cannon at a low angle.

Table 3 shows test results for maximum rate-of-fire in the system development phase before and after PIM program officials improved howitzer hardware and software and FCoE officials trained test crews.

Table 3. Test Results for Maximum Rate-of-Fire in the System Development Phase

[illegible]

¹³ The Acting DASD(DT&E) stated that stressful firing conditions occur when crew members use multiple explosive charges and fire the howitzer cannon at a high angle.

Maximum Rate-of-Fire Requirements Unclear for Different Firing Conditions

FCoE officials did not write a clear requirement for maximum rate-of-fire in the PIM program capability production document.

(FOUO) FCoE officials did not write a clear requirement for maximum rate-of-fire in the PIM program capability production document. FCoE officials did not differentiate the requirement for maximum rate-of-fire for stressful and nonstressful firing conditions. Specifically, FCoE officials did not identify longer times for stressful firing conditions, despite Army guidance¹⁴ that [REDACTED]

(FOUO) In November 2015, ATEC officials tested initial production howitzers during stressful and nonstressful firing conditions. ATEC officials stated that howitzers failed the test for maximum rate-of-fire during stressful firing conditions. A DOT&E official stated that howitzers may have passed this test if howitzer crews had been [REDACTED]

A DOT&E official stated that three factors affect rate-of-fire performance: howitzer hardware and software, crew training, and a clear requirement that differentiates stressful and nonstressful firing conditions. PIM program officials addressed or planned to address two of these three factors. PIM program officials improved howitzer hardware and software and planned to train test crews before operational tests in October 2016. However, FCoE officials did not initiate changes to the requirement for maximum rate-of-fire to differentiate stressful and nonstressful firing conditions until March 2016.

Maximum Rate-of-Fire Requirement Revision Continues

In March 2016, FCoE officials briefed their leadership that PIM howitzers did not demonstrate the capability to consistently pass the maximum rate-of-fire requirement and provided options for the way forward. An FCoE official stated that the Deputy to the FCoE Commander directed FCoE officials to rewrite the requirement to clearly reflect the operational requirement for the howitzer. The Commander, FCoE, submitted a request to clarify the rate-of-fire requirement for different firing conditions through the Army Capabilities Integration Center in May 2016. As of June 7, 2016, Headquarters, Department of the Army, planned to review and approve the rate-of-fire requirement change. FCoE officials stated they planned to submit the revised requirement to the Joint Requirements Oversight Council in August 2016.

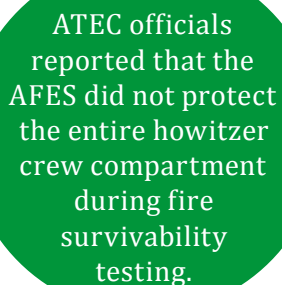
¹⁴ Army Training Circular 3-09.8, "Field Artillery Gunnery," November 15, 2013.

Howitzers did not meet the maximum rate-of-fire requirement during developmental tests or during initial production tests. Without a clear requirement that differentiates stressful and nonstressful firing conditions, the howitzer risks failing operational tests for maximum rate-of-fire. The Commander, FCoE, should include a clear maximum rate-of-fire requirement for different firing conditions in the capability production document before operational testing.

PIM Program Officials Continued to Address Test Community Recommendation for AFES

PIM program officials continued to address a test community recommendation to incorporate additional AFES coverage in howitzer crew compartments. The AFES rapidly extinguishes fires to avoid or minimize damage to vehicles and crews. The AFES also protects vehicles and crews performing in operational missions when vehicles or crews may otherwise become a combat loss. PIM program officials incorporated AFES in howitzers to comply with Army guidance,¹⁵ which requires fixed and portable fire extinguishers in combat vehicles.

The PIM program capability production document, dated January 13, 2014, stated that the Army must equip howitzer crew compartments with automatic fire detection and suppression systems that automatically detect and extinguish hazardous fires. The AFES monitors and extinguishes fires from petroleum, oil, lubricant, or from an explosion in the personnel heater. PIM program officials designed howitzer crew compartments with one AFES sensor near the personnel heater.



ATEC officials reported that the AFES did not protect the entire howitzer crew compartment during fire survivability testing.

During the system development phase, ATEC officials did not test the AFES on PIM vehicles because a production-representative AFES was not available for testing until 2014. After the PIM program entered the initial production phase, ATEC officials tested AFES on PIM vehicles from August 2014 through May 2015. ATEC officials reported that the AFES did not protect the entire howitzer crew compartment during fire survivability testing. The test community recommended that PIM program officials investigate ways to incorporate additional AFES coverage in howitzer crew compartments.

¹⁵ Army Regulation 385-10, "The Army Safety Program," June 14, 2010.

PIM Program Officials Disagreed with Test Community Recommendation but Explored Methods to Fix Deficiency

PIM program officials initially disagreed with the test community recommendation to provide additional AFES coverage in howitzer crew compartments. In January 2015, the DOT&E recommended PIM program officials fix the AFES deficiency in howitzer crew compartments based on preliminary AFES test data. However, PIM program officials stated that the howitzer AFES functioned as designed. PIM program officials also stated that howitzers contained several layers of protection, including two portable fire extinguishers, to mitigate potential fire vulnerabilities.

(FOUO) In September 2015, ATEC and DOT&E officials recommended that PIM program officials incorporate additional AFES coverage in howitzer crew compartments based on finalized test data on fire survivability. The test data on fire survivability showed that howitzer crew compartments were vulnerable to fires. In response, PIM program officials initiated an engineering project to explore methods to expand AFES coverage in howitzer crew compartments. However, PIM program officials did not plan to redesign the vehicles in the near term because expanded AFES coverage could impact vehicle performance. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

PIM Program Officials Initiated an Engineering Project

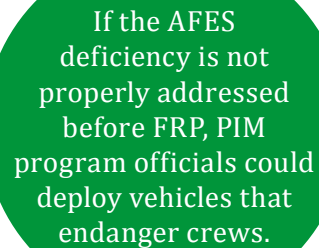
In October 2015, PIM program officials initiated an engineering project to analyze the expansion of AFES coverage in howitzer crew compartments. PIM program officials stated that the contractor would evaluate extensive redesigns, including additional AFES sensors. Specifically, PIM program officials required the contractor to:

- analyze the impact of increased AFES coverage in howitzer crew compartments;
- evaluate extinguisher requirements in howitzer crew compartments;
- propose different options for AFES sensor and extinguisher locations;
- evaluate the impact of additional AFES coverage on the control panel;
- (FOUO) recommend the best course of action for full crew compartment AFES coverage [REDACTED] and
- estimate cost and timeline for design and implementation.

¹⁶ (FOUO) [REDACTED]

PIM program officials stated that they would determine the best solution for howitzer crew compartments when the contractor delivered redesign options with associated cost and timeline estimates. PIM program officials estimated project completion in June 2016.

Although PIM program officials continued to address the AFES deficiency in howitzer crew compartments, a DOT&E live-fire test official did not think PIM program officials could fix the deficiency before beginning FRP. PIM program officials will accept a total of 37 howitzers and deploy the first vehicles in March 2017. An extensive AFES redesign could require significant human resources and time. If the AFES deficiency is not properly addressed before FRP, PIM program officials could deploy vehicles that endanger crews. Further, PIM program officials may need to retrofit more than 37 howitzers to fix the AFES deficiency. The Program Executive Officer, Ground Combat Systems, should evaluate and fix the AFES deficiency in howitzer crew compartments before deploying the first vehicles to minimize fire risk to soldiers and reduce retrofit costs.



If the AFES deficiency is not properly addressed before FRP, PIM program officials could deploy vehicles that endanger crews.

Conclusion

PIM program officials justified their plan to use 33 of 133 initial production vehicles for logistics demonstration support and Government tests. PIM program officials planned to maintain production and gradually increase production of the remaining 100 initial production vehicles before FRP. Further, PIM program officials initiated and tested fixes for most performance deficiencies identified in the system development phase. PIM program officials began developmental testing of initial production vehicles in May 2015 and will continue testing through September 2016. Additionally, PIM program officials planned to verify system performance during operational testing before the decision in March 2017 to begin FRP.

FCoE officials continued to address a test community recommendation to reevaluate the howitzer maximum rate-of-fire primary requirement before operational testing. In March 2016, FCoE officials started to clarify the howitzer maximum rate-of-fire requirement to distinguish different firing conditions. FCoE officials planned to submit the requirement revision to the Joint Requirements Oversight Council in August 2016. Despite this plan, FCoE officials may not obtain the Joint Requirement Oversight Council approval of the revised maximum rate-of-fire requirement for different firing conditions to support operational

testing planned for October 2016. PIM program officials will use operational test results to show that the PIM program is ready to enter FRP. Without a clear rate-of-fire requirement, the howitzer risks not achieving a primary performance requirement during operational testing.

Additionally, PIM program officials continued to explore ways to incorporate additional AFES coverage in howitzer crew compartments. To determine the best solution for this deficiency, PIM program officials started an engineering project with an estimated completion date of June 2016. Howitzer crews are at increased fire risk until PIM program officials resolve the AFES deficiency. Further, PIM program officials may need to retrofit more than 37 howitzers to fix the AFES deficiency in howitzer crew compartments.

Recommendations, Management Comments, and Our Response

Recommendation 1

We recommend the Commander, U.S. Army Fires Center of Excellence, include a clear maximum rate-of-fire requirement for different firing conditions in the capability production document before operational testing.

U.S. Army Fires Center of Excellence Comments

The Commander, U.S. Army Fires Center of Excellence, agreed with the recommendation, stating he approved a request to clarify the rate-of-fire requirement for different firing conditions in the capability production document on May 6, 2016. He agreed to clarify the requirement before operational testing. As of June 7, 2016, Headquarters, Department of the Army, planned to review and approve the rate-of-fire requirement change.

Our Response

Comments from the Commander addressed the specifics of the recommendation, and no further comments are required.

Recommendation 2

We recommend the Program Executive Officer, Ground Combat Systems, evaluate and fix the deficiency in the automatic fire extinguisher system in howitzer crew compartments before deploying the first vehicles to minimize fire risk to soldiers and reduce retrofit costs.

Program Executive Office, Ground Combat Systems Comments

The Deputy Program Executive Officer, Ground Combat Systems, responding for the Program Executive Officer, disagreed with the recommendation, stating the PIM program howitzer is more capable and safer for the crew than the previous system. He stated that the previous system does not contain automatic fire suppression in the crew compartment. He also stated that the PIM program howitzer is the first Army self-propelled howitzer to include automatic fire suppression in the crew compartment.

The Deputy stated the Army would need to significantly redesign and delay fielding the PIM program howitzer to add more AFES coverage in the crew compartment. He also stated the fielding delay will risk soldier safety and decrease Army capabilities. The Army may consider a future redesign of the PIM program howitzer crew compartment to increase cannon range capabilities. The Army may separate the ammunition compartment and improve fire suppression in future redesigns.

The Deputy stated the PIM program howitzer met AFES requirements. Specifically he stated the:

- PIM program howitzer is equipped with an AFES in the engine and crew compartment to automatically detect and extinguish hazardous fires;
- PIM program howitzer is equipped with engine and crew compartment internal and external manual backup fire suppression systems;
- PIM program and other Army vehicles use common AFES sensors and extinguishing agents;
- PIM program howitzer is equipped with an AFES sensor and nozzle directed at the personnel heater; and
- PIM program howitzer included two portable fire extinguishers.

Our Response

The Deputy Program Executive Officer, Ground Combat Systems, did not address the specifics of the recommendation. We agree that the PIM program howitzer includes fire suppression in crew compartments and is designed to meet the AFES requirements the Deputy cited. However, test data on fire survivability from August 2014 to May 2015 showed howitzer crew compartments were vulnerable to fires and that the AFES did not protect the entire crew compartment. The PIM program capability production document stated that PIM vehicles will be subjected to combat zone threats, such as direct or collateral damage from ballistic missiles and rockets, and blasts from improvised explosive devices. These impacts could initiate fires in howitzer crew compartments; therefore, the ability to rapidly extinguish fires is necessary to protect crews.

Furthermore, two members of the test community recommended changes to the AFES. In January 2015, the DOT&E recommended PIM program officials fix the AFES deficiency in howitzer crew compartments based on preliminary AFES test data. In September 2015, ATEC and DOT&E officials recommended that PIM program officials incorporate additional AFES coverage in howitzer crew compartments based on finalized test data on fire survivability.

The Army provided no supporting documents, information, or analysis to show that incorporating additional AFES coverage in the howitzer crew compartments could delay fielding. Further, the Army provided no support to show mission, readiness, or cost impacts if fielding delays occur.

As stated in our report, in October 2015, PIM program officials initiated an engineering project to analyze the expansion of AFES coverage in howitzer crew compartments. PIM program officials tasked the contractor to propose different options for AFES sensor and extinguisher locations; estimate cost and timeline for design and implementation; and recommend the best course of action for full crew compartment AFES coverage. On July 7, 2016, the Product Manager, Self-Propelled Howitzer Systems, stated the contractor completed the engineering project. However, the contractor had not provided the report to PIM program officials.

Although the Army may consider a future redesign to improve fire suppression, the Deputy did not include a specific timeline for planned corrective actions or take into account the results and recommendations of the AFES engineering project. Without addressing the AFES deficiency in howitzer crew compartments, the Army could deploy vehicles that endanger crews. Therefore, we ask that the Program Executive Officer fix the deficiency in the AFES in howitzer crew compartments before deploying the first vehicles. We also request that the Program Executive Officer provide an action plan and completion dates to address the results and recommendations of the AFES engineering project.

Appendix A

Scope and Methodology

We conducted this performance audit from October 2015 through May 2016 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

We interviewed PIM program stakeholders from the following offices: Assistant Secretary of Defense for Acquisition (Tactical Warfare Systems); DASD(DT&E); Deputy Assistant Secretary of Defense (Systems Engineering); DOT&E; Assistant Secretary of the Army (Acquisition, Logistics, and Technology); Program Executive Office, Ground Combat Systems; PIM Program Office; ATEC; Training and Doctrine Command, FCoE; Deputy Chief of Staff, G-3/5/7, Operations; and Deputy Chief of Staff, G-8, Financial Management.

We obtained and reviewed the following documents that supported the PIM program initial production plan, test plans, and test results:

- DASD(DT&E) PIM Rate-of-Fire Test Summary, February 4, 2016;
- Detailed Test Plan for the Full-Up System Level Live-Fire Test of the M109 Family of Vehicles, M109A7 Self-Propelled Howitzer and M992A3 Carrier, Ammunition, Tracked, October 2015;
- M109A7 AFES Overview, September 2015;
- Product Manager, Self-Propelled Howitzer System, Program Management Review, August 2015;
- Test Record for the M109 Family of Vehicles Self-Propelled Howitzer 5A Ballistic Exploitation Test, August 2015;
- Final Report for the M109A7 Self-Propelled Howitzer and M992A3 Carrier, Ammunition, Tracked Fire Survivability Test, July 2015;
- Test and Evaluation Master Plan for the M109A7 Family of Vehicles PIM Self-Propelled Howitzer and Carrier, Ammunition, Tracked, March 2015;
- DOT&E Update on PIM Live-Fire Test and Evaluation Program, February 2015;
- Capability Production Document for the M109 Family of Vehicles, January 2014;

- Under Secretary of Defense for Acquisition, Technology, and Logistics Memorandum, “Paladin Integrated Management Acquisition Decision Memorandum,” October 21, 2013;
- PIM Defense Acquisition Board Review, October 18, 2013;
- DASD(DT&E) Assessment of M109 Family of Vehicles PIM for Milestone C, August 29, 2013;
- DOT&E Assessment of M109 Family of Vehicle PIM Limited User Test Results, August 15, 2013; and
- ATEC Operational Test Agency Milestone Assessment Report for the M109 Family of Vehicles PIM, April 2013.

To determine whether test plans and results adequately prepared the program for FRP, we reviewed seven primary and two secondary performance requirements that the test community reported as deficiencies at the time of the decision to begin initial production. In addition, we reviewed one third-level requirement deficiency related to crew safety. The 10 performance requirements were: net ready, force protection, survivability, rate-of-fire, digital fire control system, howitzer and ammunition carrier availability, obstacle crossing, firing accuracy, and AFES.

We reviewed legal requirements and policy guidance in the following United States Code and DoD issuances:

- Section 2399, title 10, United States Code, “Operational test and evaluation of defense acquisition programs,” January 2012;
- Section 2400, title 10, United States Code, “Low-rate initial production of new systems,” January 2012;
- DoD Instruction 5000.02, “Operation of the Defense Acquisition System,” January 7, 2015;
- Army Training Circular 3-09.8, “Field Artillery Gunnery,” November 15, 2013; and
- Army Regulation 385-10, “The Army Safety Program,” June 14, 2010.

Use of Computer-Processed Data

We did not use computer-processed data to perform this audit.

Use of Technical Assistance

We did not use technical assistance in conducting this audit.

Prior Coverage

During the last 5 years, the Government Accountability Office (GAO) issued five reports and the Army Audit Agency issued one report on the PIM program. Unrestricted GAO reports can be accessed at <http://www.gao.gov>. Unrestricted Army Audit Agency reports can be accessed from .mil and gao.gov domains at <https://www.aaa.army.mil/>.

GAO

Report No. GAO-16-329SP, "Defense Acquisitions: Assessments of Selected Weapon Programs," March 2016

Report No. GAO-15-503, "DoD Operational Testing Oversight Has Resulted in Few Significant Disputes and Limited Program Cost and Schedule Increases," June 2015

Report No. GAO-15-342SP, "Defense Acquisitions: Assessments of Selected Weapon Programs," March 2015

Report No. GAO-14-340SP, "Defense Acquisitions: Assessments of Selected Weapon Programs," March 2014

Report No. GAO-13-294SP, "Defense Acquisitions: Assessments of Selected Weapon Programs," March 2013

Army

Report No. A-2011-0116-ALA, "Paladin Integrated Management Costs," May 2011

Appendix B

Summary of Performance Deficiencies in the System Development Phase, Planned Corrective Actions, and Test Plans and Results in the Initial Production Phase

Performance Requirement	System Development Phase Deficiencies	Planned Corrective Actions	Initial Production Phase Test Plans and Results
Net Ready (Primary)	Partially met. Limited cybersecurity and interoperability testing.	Planned to test cybersecurity and interoperability with upgraded software.	Ongoing. Tested cybersecurity in May 2015 and February 2016. Additional cybersecurity test planned for October 2016. Interoperability test planned for May 2016.
Force Protection (Primary)	Partially met. Vulnerable areas identified.	Planned to fix vulnerable areas.	Ongoing. Tested fixes to vulnerable areas from February through April 2015. Full system tests from August 2015 through October 2016.
Survivability (Primary)	Partially met. Vulnerable areas identified.	Planned to fix vulnerable areas.	Ongoing. Tested fixes to vulnerable areas from February through April 2015. Full system tests from August 2015 through October 2016.
Rate-of-Fire (Primary)	Not met. Test community recommended Army officials reevaluate requirement. Crew training important to meet requirement.	Changed hardware and software and increased crew training.	Ongoing. Completed rate-of-fire test in November 2015. Test results indicated crews failed howitzer maximum rate-of-fire requirements. Army officials initiated changes to the requirement in March 2016. Operational test planned for October 2016.
Digital Fire Control System (Primary)	Partially met. Software errors disabled the system.	Upgraded software to improve system performance.	Ongoing. Completed software tests from April through June 2015. Upgraded software met requirements. Additional tests planned from April through June 2016. Operational test planned for October 2016.
Availability (Primary)	Not assessed. No valid data available because contractor performed maintenance.	Planned to assess PIM vehicle maintenance during logistics demonstration, reliability, and operational testing.	Ongoing. No data. Initial reliability tests completed by June 2016. Started PIM vehicle logistics demonstration from January to February 2016. Reliability and operational tests planned for October 2016.
Obstacle Crossing (Secondary)	Partially met. Stopped howitzer testing to avoid suspension damage. No tests on ammunition carrier.	Changed suspension and planned to test ammunition carrier.	Ongoing. Production qualification tests planned from May 2015 to September 2016.
Accuracy (Secondary)	Partially met. Howitzer met long-range requirement but did not meet short-range requirement.	Updated short-range accuracy requirements.	Tested accuracy in February 2016.
AFES (Third-level)	Not assessed. No production-representative AFES on prototype vehicles.	Installed AFES on PIM vehicles and conducted fire survivability testing.	Ongoing. Completed AFES testing in May 2015. PIM vehicles met most AFES requirements; however, AFES did not protect the entire howitzer crew compartment. Full system tests from August 2015 through October 2016.

Management Comments

U.S. Army Fires Center of Excellence



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY FIRES CENTER OF EXCELLENCE AND FORT SILL
OFFICE OF THE COMMANDING GENERAL
455 MCNAIR AVENUE, SUITE 100
FORT SILL, OKLAHOMA 73503

ATZR-C

7 June 2016

MEMORANDUM THRU

Army Capabilities Integration Center (ARCIC), ATTN: Chief, Fires Division, Training and Doctrine Command (TRADOC), 950 Jefferson Avenue Fort Eustis, VA 23604

Headquarters, Training and Doctrine Command (TRADOC), 950 Jefferson Avenue Fort Eustis, VA 23604-5700

Headquarters, Department of the Army (HQDA), ATTN: G3/5/7, 200 Army Pentagon, Washington D.C. 20310-0200

FOR Department of Defense Inspector General, 4800 Mark Center Drive, Alexandria, VA 22350-1500

SUBJECT: Fires Center of Excellence Response to the Draft Report for Project D2016-D000AU-0003.000, "Army Justified the Paladin Integrated Management Program but Has Not Resolved Two Vehicle Performance Deficiencies"

1. Reference Memorandum, Department of Defense Office of the Inspector General, May 26, 2016, Subject: "Army Justified the Paladin Integrated Management Program but Has Not Resolved Two Vehicle Performance Deficiencies" 26 May 2016 (Project No. D2016-D000AU-0003.000).
2. The enclosed response from the U.S. Army Fires Center of Excellence (FCOE) to this request for follow-up information has been reviewed and staffed by the Army Capabilities Integration Center (ARCIC) at Headquarters, Training and Doctrine Command (TRADOC) for continuity and clarity.
3. The FCOE response to the Inspector General report specifically addresses Recommendation 1 which cites a lack of clarity in regard to the maximum Rate of Fire requirement within the M109 Family of Vehicles (FoV) Capability Production Document (CPD). This finding is valid and the Commanding General, FCOE, concurs with the recommendation to clarify this requirement prior to operational testing. A memorandum signed by the CG, FCOE, on 6 May 2016, includes a request to approve a change clarifying the Rate of Fire requirement in the M109FoV CPD (enclosure 2).

U.S. Army Fires Center of Excellence (cont'd)

ATZR-C

SUBJECT: Fires Center of Excellence Follow-Up on D2016-D000AU-0003.000, "Army Justified the Paladin Integrated Management Program but Has Not Resolved Two Vehicle Performance Deficiencies"

4. The Inspector General Report Recommendation 2, addressing the automatic fire extinguisher system, is assigned to the Program Executive Officer, Ground Combat Systems, and a response is being developed by that office.


5. The point of contact for this action is [REDACTED] TCM BCT Fires, Capabilities Development and Integration Directorate, FCoE, Fort Sill, Oklahoma, at Commercial: [REDACTED].

2 Encl

1. FCoE Response to DoD IG

Draft Report

2. M109FoV CPD Change Request Memo


JOHN G. ROSSI
Major General, USA
Commanding

U.S. Army Fires Center of Excellence (cont'd)

**Final Report
Reference**

**DOD IG REPORT – DATED MAY 26, 2016
DOD IG REPORT NO.**

**“ARMY JUSTIFIED INITIAL PRODUCTION PLAN FOR THE PALADIN INTEGRATED
MANAGEMENT PROGRAM BUT HAS NOT RESOLVED TWO VEHICLE
PERFORMANCE DEFICIENCIES”**

**COMMANDER, ARMY FIRES CENTER OF EXCELLENCE (FCOE)
RESPONSE TO THE DOD IG DRAFT REPORT**

(26 MAY 16) DOD Recommendation for Commander, U.S. Army Fires Center of Excellence:

Recommendation 1: We recommend the Commander, U.S. Army Fires Center of Excellence, include a clear maximum rate-of-fire requirement for different firing conditions in the capability production document before operational testing.

(7 JUN 16) Commander, U.S. Army Fires Center of Excellence Response:

Recommendation 1: Concur. The Commander, U.S. Army Fires Center of Excellence approved a request to change the rate of fire requirement within the Paladin Integrated Management (PIM) Capability Production Document (CPD) on 6 May 2016 (enclosure 2). This change clarifies the rate of fire requirement for different firing conditions. This request was forwarded thru the Army Capabilities Integration Center (ARCIC) to the Army Gatekeeper for requirement documents on 26 May 2016 and is currently under review and awaiting an official timeline for approval by Headquarters, Department of the Army (HQDA).

**Report page 10
updated based on
FCoE management
comments.**

Point of contact for this document is [REDACTED] TCM Brigade Combat Team Fires at Fort Sill, OK. [REDACTED] or by electronic mail at [REDACTED]

U.S. Army Fires Center of Excellence (cont'd)

REPLY TO
ATTENTION OF

ATSF-FR

DEPARTMENT OF THE ARMYHEADQUARTERS, UNITED STATES ARMY FIRES CENTER OF EXCELLENCE AND FORT SILL
FORT SILL, OKLAHOMA 73503-5000

MAY 06 2016

MEMORANDUM THRU Director, Army Capabilities Integration Center, Requirements
Integration Directorate (ATFC-DF), 950 Jefferson Avenue, Ft Eustis, VA 23604-5761

FOR Deputy Chief of Staff, G8 (DAMO-CIC/██████████), 700 Army Pentagon,
Washington, DC 20310-0700

SUBJECT: Request for Approval of Changes to the Capabilities Development
Document (CPD) for the M109 Family of Vehicles (FOV)

1. References:

a. CJCSI 3170.011, Joint Capabilities Integration & Development System, 23
January 2015, including errata as of 5 May 2015.

b. Manual for the Operation of the Joint Capabilities Integration and Development
System (JCIDS), 12 February 2015, including errata as of 18 December 2015, URL:
https://www.intelink.gov/wiki/JCIDS_Manual.

2. Request Deputy Chief of Staff, G-8 review and approve the proposed changes to the
document.

3. The following information is provided:

a. Program Category: ACAT IC

b. Next Milestone: N/A

c. Joint Designator: JROC Interest

d. Proponent: Fires Center of Excellence

4. Proposed Changes:

a. Update M109 Howitzer Key Performance Parameters (KPP) #6 (Range) to
provide valid objective range requirements to support expansive areas of operation and
to mitigate current threat cannon range overmatch. Capitalization of key advancements
in projectile and propellant capabilities cannot be achieved without foundational
improvements to the M109A7 howitzer M284 cannon tube assembly. The Extended

U.S. Army Fires Center of Excellence (cont'd)

ATSF-FR

SUBJECT: Request for Approval of Changes to the Capabilities Development Document (CPD) for the M109 Family of Vehicles (FOV)

Range Cannon Artillery (ERCA) science and technology effort is based upon firing platforms equipped with cannon tubes that are longer than the current 39 caliber and designed to handle more powerful, advanced propellants. Objective maximum range of 70km is necessary to mitigate the existing cannon range gap.

b. Change the M109 Howitzer Rate of Fire KPP5 to more adequately describe and quantify firing rates under specific conditions and mission parameters. The intent of the rate of fire system attribute is to ensure PIM is mechanically able to meet various mission requirements independent of unpredicted crew error and defective or mishandled munition components. This change will align the system attribute with the technical performance required of the PIM platform. The resulting redefinition of the requirement is better characterized as a key system requirement than a key performance requirement and thereby recommend changing KPP 5 to Key System Attribute (KSA) 7 Rate of Fire.

c. These two sets of proposed changes to the CPD do not impact program cost or schedule and do not significantly alter the intent of the existing validated requirement; therefore, the sponsor requests a waiver for a complete update of the CPD which would add prohibitive cost and program impacts and would be unresponsive to the urgency of this critical capability development.

5. Point of contact is [REDACTED], Requirements Development Division, Capabilities Development Integration Directorate (CDID), commercial [REDACTED]
[REDACTED]


JOHN G. ROSSI
Major General, USA
Commanding

Encls

1. M109 Family of Vehicles CPD
2. Errata sheet

Program Executive Office, Ground Combat Systems

Final Report
Reference



DEPARTMENT OF THE ARMY
PROGRAM EXECUTIVE OFFICE
GROUND COMBAT SYSTEMS
6601 EAST ELEVEN MILE ROAD
WARREN, MICHIGAN 48397-5000

SFAE-GCS

JUN 24 2016

MEMORANDUM THRU Assistant Secretary of the Army (Acquisition, Logistics and Technology) (ASA (ALT)), 105 Army Pentagon Washington, DC 20310-0105

FOR Program Director of Acquisition and Sustainment Management, Department of Defense Office of the Inspector General, 4800 Mark Center Drive, Alexandria, Virginia 22350-1500

SUBJECT: Army Justified Initial Production Plan for the Paladin Integrated Management Program but Has Not Resolved Two Vehicle Performance Deficiencies (Project No. D2016-D000AU-0003.000)

1. Reference memorandum, DoDIG, dated 26 May 2016, subject as above.
2. The Program Executive Office Ground Combat System (PEO GCS) has reviewed subject DoDIG Draft Report and disagree with your report finding, conclusion and Recommendation 2. Our specific comments are contained in the enclosed reply. Also, the Request for Security Marking Review document is enclosed.
3. The TACOM Internal Review and Audit Compliance Office will track the status of the corrective actions to the recommendations and verify the actions have been completed.
4. Point of contact for this action is [REDACTED]

2 Encls

TH Bagwell
THOMAS H. BAGWELL, JR.
Deputy Program Executive Officer,
Ground Combat Systems

**Request for
Security Marking
Review omitted
because it was
not related to
management
comments.**

Program Executive Office, Ground Combat Systems (cont'd)

**Program Executive Officer, Ground Combat Systems Comments to DOD Inspector
General Draft Report,
Army Justified Initial Production Plan for the Paladin Integrated Management
Program but Has Not Resolved Two Vehicle Performance Deficiencies
(Project No. D2016-D000AU-0003.000)**

Objective: DoDIG determined whether the Army effectively managed the Paladin Integrated Management (PIM) program during the production and deployment phase. Specifically, DoDIG evaluated whether program officials justified the low-rate initial production plan and whether test plans and results adequately prepared the program for full-rate production (FRP). This report is the first in a series of reports on the Army PIM program.

DoDIG Conclusion: PIM program officials justified their plan to use 33 of 133 initial production vehicles for logistics demonstration support and Government tests. PIM program officials planned to maintain production and gradually increase production of the remaining 100 initial production vehicles before FRP. Further, PIM program officials initiated and tested fixes for most performance deficiencies identified in the system development phase. PIM program officials began developmental testing of initial production vehicles in May 2015 and will continue testing through September 2016. Additionally, PIM program officials planned to verify system performance during operational testing before the decision in March 2017 to begin FRP.

However, Fire Center of Excellence (FCoE) officials continued to address a test community recommendation to reevaluate the howitzer maximum rate-of-fire primary requirement before operational testing. In March 2016, FCoE officials started to clarify the howitzer maximum rate-of-fire requirement to distinguish different firing conditions. FCoE officials planned to submit the requirement revision to the Joint Requirements Oversight Council in August 2016. Despite this plan, FCoE officials may not obtain the Joint Requirement Oversight Council approval of the revised maximum rate-of-fire requirement for different firing conditions to support operational testing planned for October 2016. PIM program officials will use operational test results to show that the PIM program is ready to enter FRP. Without a clear rate-of-fire requirement, the howitzer risks not achieving a primary performance requirement during operational testing.

Additionally, PIM program officials continued to explore ways to incorporate additional Automatic Fire Extinguisher System (AFES) coverage in howitzer crew compartments. To determine the best solution for this deficiency, PIM program officials started an engineering project with an estimated completion date of June 2016. Howitzer crews are at increased fire risk until PIM program officials resolve the AFES deficiency. Further, PIM program officials may need to retrofit more than 37 howitzers to fix the AFES deficiency in howitzer crew compartments.

Additional facts: None

Program Executive Office, Ground Combat Systems (cont'd)

Recommendation 2: We recommend the Program Executive Officer, Ground Combat Systems, evaluate and fix the deficiency in the automatic fire extinguisher system in howitzer crew compartments before deploying the first vehicles to minimize fire risk to soldiers and reduce retrofit costs.

Program Executive Officer, Ground Combat Systems Comments:

Recommendation 2. Non-Concur. PM AFV disagrees with the recommendation to “fix” the AFES coverage prior to fielding the system.

Rational: The M109A7 howitzer is more capable and provides greater safety for the crew than today's fielded M109A6 Paladin system, which currently has no automatic fire suppression in the crew compartment whatsoever. The M109A7 is the first self-propelled howitzer in the US Army inventory to have any automatic fire suppression in the crew compartment. Adding additional AFES coverage in the portion of the crew area that does not currently have it will require a major redesign and delay in fielding; during which Soldiers will be less safe and Army units less capable for an extended period of time. The Army is currently contemplating a future redesign of the cab in order to increase the range of the cannon. The PM intends to consider ammunition compartmentalization as part of the potential scope and will also consider improved fire suppression technologies at that time.

Current CPD and vehicle requirements for reference (all of which have been met with the M109A7):

CPD Additional Attribute, AA7:

"In accordance with AR385-10, the platform shall be equipped with automatic fire detection and suppression systems in the crew and engine compartments capable of automatically sensing and extinguishing hazardous fires, and provides internal and external manually initiated back-up. The AFES shall use components common with other HBCT platforms. T=O"

CPD requirement analysis:

"...automatic fire detection and suppression systems in the crew and engine compartments capable of automatically sensing and extinguishing hazardous fires .."

The M109A7 vehicle is equipped with Automated Fire Extinguishing System in both engine and crew to automatically detect and extinguish hazardous hydrocarbon fires.

".... provides internal and external manually initiated back-up."

The M109A7 vehicle is equipped with both engine and crew manual back up: by either electrical activation at the Control Electronics Panel or with manual pull activation for the engine located in the driver's compartment and external manual activation for both crew and engine compartments.

Program Executive Office, Ground Combat Systems (cont'd)

"The AFES shall use components common with other HBCT platforms."

Sensors - common with M2/M3 Bradley and M992A2 FAASV platforms. Agent HFC-227BC (per the US DoD direction to phase out ozone- depleting materials per the Montreal Protocol and EPA Clean Air Act Section 604) is common with engine compartment agents in the M2/M3 Bradley, M992A2 FAASV, Stryker, and MRAP-MATV

M109A7 Vehicle Requirements

3.3.3.3.1.3 Personnel Heater Protection AFES.

The Personnel Heater Protection AFES shall be capable of detecting and extinguishing fires originating at the Personnel Heater.

The vehicle is equipped with a sensor and nozzle directed at the Personnel Heater to extinguish hydrocarbon fires originated from the Personnel Heater.

AR385-10 - 14-4 c.

Army vehicles transporting ammunition or explosives will be equipped with at least two Class 2-A 10BC or equivalent fire extinguishers.

The M109A7 vehicle is equipped with two portable 2.50 lb CO2 fire extinguishers (class 2-A 10BC)

Acronyms and Abbreviations

ATEC	Army Test and Evaluation Command
AFES	Automatic Fire Extinguisher System
DASD(DT&E)	Deputy Assistant Secretary of Defense (Developmental Test and Evaluation)
DOT&E	Director, Operational Test and Evaluation
FCoE	Fires Center of Excellence
GAO	Government Accountability Office
FRP	Full-Rate Production
PIM	Paladin Integrated Management

Whistleblower Protection

U.S. DEPARTMENT OF DEFENSE

The Whistleblower Protection Ombudsman's role is to educate agency employees about prohibitions on retaliation and employees' rights and remedies available for reprisal.

The DoD Hotline Director is the designated ombudsman.

For more information, please visit the Whistleblower webpage at www.dodig.mil/programs/whistleblower.

For more information about DoD IG reports or activities, please contact us:

Congressional Liaison

congressional@dodig.mil; 703.604.8324

Media Contact

public.affairs@dodig.mil; 703.604.8324

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